Daniel A. Handwerker

CONTACT INFORMATION

Section on Functional Imaging Methods
National Institute of Mental Health
Building 10, Room 1D80
10 Center Dr. MSC 1148
Bethesda, MD 20892-1148

https://fim.nimh.nih.gov
https://github.com/handwerkerd
Lab Phone: 301-402-1359
Lab Fax: 301-402-1370
Email: handwerkerd@mail.nih.gov

EDUCATION AND RESEARCH EXPERIENCE

Staff Scientist 08/14 – Present
Research Fellow 12/09 – 07/14
Postdoctoral Fellow 10/07 – 11/09
Section on Functional Imaging Methods, National Institute of Mental Health
Supervisor: ***Peter Bandettini***, Ph.D.

Using fMRI and other measures to better understand activity and connections across brain regions and the neural basis of those connections. Supporting research of others in SFIM

Postdoctoral Fellow, Department of Radiology 1/06 – 8/07
University of California, San Francisco
Primary Mentor: ***Roland G. Henry***, Ph.D. Co-Mentor: ***Robert T. Knight***, M.D.

Used fMRI and DTI to study neural changes multiple clinical conditions.

Ph.D., Joint Graduate Group in Bioengineering 8/00 – 12/05
University of California, Berkeley and San Francisco
Assessing Variability of the fMRI BOLD Response to Neural Activity
Mark D'Esposito, M.D. (chair), Richard Ivry, Ph.D., Sarah Nelson, Ph.D.

Studied the methodology and applications of fMRI to cognitive neuroscience, especially focusing on Blood Oxygen Level Dependent signal variability across brain regions, individuals, and clinical populations, and how analyses can account for this variability.

B.S. (Biomedical Engineering), B.A. (Computer Science), Minor (Psychology) 9/96 – 5/00
Johns Hopkins University
Research Mentors:

Steven Yantis, Ph.D. 9/98 – 5/99, 9/99 – 6/00

Studied human attention using psychophysical methods.
Assisted with the design and implementation of the lab's first fMRI study.

Karen Berman, M.D. (NIH Summer Fellowship) 6/99 – 8/99

Examined brain structure of schizophrenic patients using MRI

Michael Steinmetz, Ph.D. 6/97 – 8/98

Examined the relationships between attention and short-term visual spatial memory in *Macaca mulatta* using electrophysiology and fMRI

PEER-REVIEWED PUBLICATIONS

Handwerker, D.A., Ianni, G., Gutierrez, B., Roopchansingh, V., Gonzalez-Castillo, J., Chen, G., Bandettini, P.A., Ungerleider, L.G., Pitcher, D., (2020) "Thetaburst TMS to the posterior superior temporal sulcus decreases resting-state fMRI connectivity across the face processing network" *Network Neuroscience* (in press)

Finn, E.S., Glerean, E., Khojandi, A.Y., Nielson, D., Molfese, P.J., **Handwerker, D.A.**, Bandettini, P.A., (2020) "Idiosynchrony: From shared responses to individual differences during naturalistic neuroimaging" *NeuroImage* 215

Jo, H.J., Reynolds, R.C., Gotts, S.J., **Handwerker, D.A.**, Balzekas, I., Martin, A., Cox, R.W., Bandettini, P.A. (2020) "Fast detection and reduction of local transient artifacts in resting-state fMRI" *Computers in Biology and Medicine* 120

Huber, L., Finn, E.S., **Handwerker, D.A.**, Bönstrup, M., Glen, D., Kashyap, S., Ivanov, D., Petridou, N., Marrett, S., Goense, J. Poser, B.A., Bandettini, P.A., (2020) "Sub-millimeter fMRI reveals multiple topographical digit representations that form action maps in human motor cortex" *NeuroImage* 208

Chai, Y., **Handwerker, D.A.**, Marrett, S., Gonzalez-Castillo, J., Merriam, E.P., Hall, A., Molfese, P.J., Bandettini, P.A., (2019) "Visual temporal frequency preference shows a distinct cortical architecture using fMRI" *NeuroImage* 197, 13-23

Yu, Y., Huber, L., Yang, J., Jangraw, D.C., **Handwerker, D.A.**, Molfese, P., Chen, G., Ejia, Y., Wu, J., Bandettini, P.A., (2019) "Layer-specific activation of predictive coding in the human primary somatosensory cortex" *Science Advances* 5(5)

Gonzalez-Castillo, J., Topolski, N., Caballero-Gaudes, C., **Handwerker, D.A.**, Pereira, F., Bandettini, P.A., (2019) "Imaging the spontaneous flow of thought: Distinct periods of cognition contribute to observable time-varying functional connectivity during rest" NeuroImage 202,

Xie, H., Zheng, C.Y., **Handwerker, D.A.**, Bandettini, P.A., Calhoun, V., Sunanda, M., Gonzalez-Castillo, J., (2019) "Efficacy of different dynamic functional connectivity methods to capture cognitively relevant information" NeuroImage 188, 502-514

Xie, H., Gonzalez-Castillo, J., **Handwerker, D.A.**, Bandettini, P.A., Calhoun, V.D., Damaraju, E., Mitra, S. (2019) "Time-varying whole-brain functional network connectivity coupled to task engagement" *Network Neuroscience*

Jangraw, D.C., Gonzalez-Castillo, J., **Handwerker, D.A.**, Ghane, M., Rosenberg, M.D., Panwar, P., Bandettini, P.A. (2018) "A functional connectivity-based neuromarker of sustained attention generalizes to predict recall in a reading task." *NeuroImage* 166, 99-109

Huber, L., Ivanov, D., **Handwerker, D.A.**, Marrett, S., Guidi, M., Uludağ, K., Bandettini, P.A., Poser, B.A., (2018) "Techniques for blood volume fMRI with VASO: From low-resolution mapping towards sub-millimeter layer-dependent applications." *NeuroImage* 164, 131-143

Huber, L., **Handwerker, D.A.**, Jangraw, D.C., Chen, G., Hall, A., Stüber, C., Gonzalez-Castillo, J., Ivanov, D., Marrett, S, Guidi, M., Goense, J., Poster, B.A., Bandettini, P.A., (2017) " High-Resolution CBV-fMRI Allows Mapping of Laminar Activity and Connectivity of Cortical Input and Output in Human M1." *Neuron* 96, 1253-1263

Gonzalez-Castillo, J., Panwar, P., Buchanan, L.C., Caballero_Gaudes, C., **Handwerker, D.A.,** Jangraw, D.C., Zachariou, V., Inati, S., Roopchansingh, V., Derbyshire, J.A., Bandettini, P.A., (2016) "Evaluation of multi-echo ICA denoising for task based fMRI studies: Block designs, Rapid event-related designs, and Cardiac-gated fMRI." *NeuroImage* 141, 452-468

Poldrack, R.A., Laumann, T.O., Koyejo, O., Gregory, B., Hover, A., Chen, M.-Y., Gorgolewski, K.J., Luci, J., Joo, S.J., Boyd, R.L., Hunicke-Smith, S., Simpson, Z.B., Caven, T., Sochat, V., Shine, J.M., Gordon, E., Snyder, A.Z., Adeyemo, B., Petersen, S.E., Glahn, D.C., Reese Mckay, D., Curran, J.E., Göring, H.H.H., Carless, M.A., Blangero, J., Dougherty, R., Leemans, A., **Handwerker, D.A.,** Frick, L., Marcotte, E.M., Mumford, J.A., 2015. "Long-term neural and physiological phenotyping of a single human." *Nat Commun* 6, 8885.

Gorgolewski, K.J., Auer, T., Calhoun, V.D., Craddock, R.C., Das, S., Duff, E.P., Flandin, G., Ghosh, S.S., Glatard, T., Halchenko, Y.O., **Handwerker, D.A.,** Hanke, M., Keator, D., Li, X., Michael, Z., Maumet, C., Nichols, B.N., Nichols, T.E., Pellman, J., Poline, J.-B., Rokem, A., Schaefer, G., Sochat, V., Triplett, W., Turner, J.A., Varoquaux, G., Poldrack, R.A., 2016. "The brain imaging data structure, a format for organizing and describing outputs of neuroimaging experiments." *Scientific Data*, doi:10.1038/sdata.2016.44

Wu, P., Bandettini, P.A., Harper, R.M., **Handwerker, D.A.,** 2015. "Effects of thoracic pressure changes on MRI signals in the brain." *Journal of Cerebral Blood Flow & Metabolism* 35 (6), 1024-1032.

Gonzalez-Castillo, J., Hoy, C.W., **Handwerker, D.A.,** Robinson, M.E., Buchanan, L.C., Saad, Z.S., Bandettini, P.A., 2015. "Tracking ongoing cognition in individuals using brief, whole-brain functional connectivity patterns." *Proceedings of the National Academy of Sciences* 112, 8762–8767.

Gonzalez-Castillo, J., Hoy, C.W., **Handwerker, D.A.,** Roopchansingh, V., Inati, S., Saad, Z.S., Cox, R.W., Bandettini, P.A., 2015. "Task Dependence, Tissue Specificity, and Spatial Distribution of Widespread Activations in Large Single-Subject Functional MRI Datasets at 7T," *Cerebral Cortex* 25 (12), 4667-4677.

Yang, Z., Xu, Y., Xu, T., Hoy, C.W., **Handwerker, D.A.**, Chen, G., Northoff, G., Zuo, XN, Bandettini, P.A. (2014) "Brain Network informed subject community detection in early-onset schizophrenia" *Scientific Reports*

Yang, Z., Chang, C., Xu, T., Jiang, L., **Handwerker, D.A.**, Castellanos, F.X., Milham, M.P., Bandettini, P.A., Zuo, X.N,. (2014) "Connectivity trajectory, across lifespan differentiates the precuneus from the default network" *NeuroImage* 89, 45-56.

Gonzalez-Castillo, J., **Handwerker, D.A.**, Robinson, M.E., Hoy, C.W., Buchanan, L.C., Saad, Z.S., Bandettini, P.A. (2014) "The spatial structure of resting state connectivity stability on the scale of minutes" *Front Neurosci* 8:138

Hutchinson, R.M., et. al. (2013) “Dynamic functional connectivity: Promise, issues, and interpretations” *Neuroimage* 80, 360-378

Handwerker, D.A., Roopchansingh, V., Gonzalez-Castillo, J., Bandettini, P.A. (2012) “Periodic changes in fMRI connectivity” *Neuroimage* 63, 1712-1719

Handwerker, D.A., Gonzalez-Castillo, J., D'Esposito, M., Bandettini, P.A. (2012) “The continuing challenge of understanding and modeling hemodynamic variation in fMRI” *NeuroImage* 62, 1017-23.

Gonzalez-Castillo, J., Saad, Z.S., **Handwerker, D.A.**, Inati, S.J., Brenowitz, N., Bandettini, P.A., (2012) “Whole-brain, time-locked activation with simple tasks revealed using massive averaging and model-free analysis” *Proceedings of the National Academy of Sciences* 109, 5487–5492.

Chu, C., **Handwerker, D.A.,** Bandettini, P.A. (2011) “Measuring consistency of global functional connectivity using kernel regression methods” *Proc. IEEE 2011 International Workshop on Pattern Recognition in NeuroImaging*, art. no. 5961316, 41-44.

Handwerker, D.A., Bandettini, P.A. 2011. “Simple explanations before complex theories: Alternative explanations of Siroton and Das’ observations” *Neuroimage* 55(4) 1419-22.

Handwerker, D.A., Bandettini, P.A. 2011. “Hemodynamic signals not predicted? Not so: A comment on Sirotin and Das (2009)” *Neuroimage* 55(4) 1409-12.

Birn, R.M., Murphy, K., **Handwerker, D.A.,** Bandetttini, P.A. 2009. “fMRI in the presence of task-correlated breathing variations” *Neuroimage* 47(3) 1092-1104.

Murphy, K. Birn, R.M., **Handwerker, D.A.**, Jones, T.B., Bandettini, P.A. 2009. “The impact of global signal regression on resting state correlations: Are anti-correlated networks introduced?” *Neuroimage* 44(3) 893-905.

Wilson, S.M., Brambati, S.M., Henry, R.G., **Handwerker, D.A.**, Miller, B.L., Wilkins, D.P., Ogar, J.M., Gorno-Tempini, M.L. 2009. “The neural basis of surface dyslexia in semantic dementia” *Brain* 132(1) 71-86.

Handwerker, D.A., Gazzaley, A., Inglis, B., D’Esposito, M. 2007. “Reducing vascular variability of fMRI data across aging populations using a breath holding task” *Hum Brain Mapp* 28 (9) 846-59.

Fuhrmann Alpert, G., Sun, F.T, **Handwerker, D.A.**, D’Esposito, M., Knight, R.T., 2007. “Spatio-temporal information analysis of event-related BOLD responses.” *Neuroimage* 34 (4) 1545-1561.

Handwerker, D.A., Ollinger, J.M., D’Esposito, M., 2004. “Variation of BOLD hemodynamic responses across brain regions and subjects and their effects on statistical analyses.” *Neuroimage* 21 (4), 1639-1651.

RECENT CONFERENCE ABSTRACTS

Handwerker, D.A., et. al. "tedana: Multi-echo software and communal resources" Organization for Human Brain Mapping Annual Meeting 2020

Varadarajan, R., **Handwerker, D.A.**, Molfese, P., Bandettini, P.A., "Validating multi-echo fMRI analysis methods across a range of acquisition" Organization for Human Brain Mapping Annual Meeting 2020

Khojandi, A.Y., Chai, Y., **Handwerker, D.A.**, Li, L., Huber, L., Bandettini, P.A., "Layer-dependent signal fluctuation in BOLD and VAPER fMRI" Organization for Human Brain Mapping Annual Meeting 2020

Miyawaki, Y., **Handwerker, D.A.**, Gonzalez-Castillo, J., Huber, L., Khojandi, A.Y., Chai, Y., Bandettini, P.A. "Time-resolved fast neural decoding independent of variation in hemodynamic response latency" Organization for Human Brain Mapping Annual Meeting 2020

Gonzalez-Castillo, J., **Handwerker, D.A.**, Bandettini, P.A., "Amplitude of slow fluctuations in CSF as a time-resolved marker of sleep states for resting-state fMRI: a validation study" International Society for Magnetic Resonance in Medicine Annual Meeting 2020

Miyawaki, Y., **Handwerker, D.A.**, Gonzalez-Castillo, J., Huber, L., Khojandi, A.Y., Chai, Y., Bandettini, P.A. "Event-related decoding of visual stimulus information using short-TR BOLD fMRI at 7T" International Society for Magnetic Resonance in Medicine Annual Meeting 2020

Finn, E.S., Khojandi, A., **Handwerker, D.A.**, Molfese, P.J., Bandettini, P., "Inter-subject representational similarity analysis reveals phenotype-specific patterns of brain activity during movie watching" Society for Neuroscience Annual Meeting 2019

Handwerker, D.A., Kim, S.H., Ma, Y., Shaik, M., Thibodeaux, D., Montgomery, M., Zhao, T., Gonzalez-Castillo, J., Molfese, P., Nielson, D., Hillman, E.M., Bandettini, P.A., "Stability of functional connectivity in mice using wide field optical mapping" Organization for Human Brain Mapping Annual Meeting 2019

DuPre, E., Gonzalez-Castillo, J., **Handwerker, D.**, Markello, R., Salo, T., Whitaker, K. "Tedana: Robust and extensible software for multi-echo denoising" Organization for Human Brain Mapping Annual Meeting 2019

Finn, E., Khojandi, A., Molfese, P., **Handwerker, D.**, Bandettini, P., "Predicting individual traits based on functional connectivity during different video clips" Organization for Human Brain Mapping Annual Meeting 2019

Khojandi, A., Finn, E., **Handwerker, D.,** Molfese, P., Bandettini, P., "Comparing synchrony of brain activity evoked by different video clips via inter-subject correlation" Organization for Human Brain Mapping Annual Meeting 2019

Gonzalez-Castillo, J., Caballero-Gaudes, C., Topolski, N., Pereira, F., **Handwerker, D.**, Bandettini, P., "Contributions of covert self-driven cognition to resting state dynamic functional connectivity" Organization for Human Brain Mapping Annual Meeting 2019

Gonzalez-Castillo, J., Caballero-Gaudes, C., Topolski, N., Pereira, F., **Handwerker, D.**, Bandettini, P., "Periods of discernible cognition contribute to dynamic functional connectivity during rest" International Society for Magnetic Resonance in Medicine Annual Meeting 2019

Handwerker, D.A., Kim, S.H., Shaik, M., Thibodeaux, D., Montgomery, M., Zhao, T., Gonzalez-Castillo, J., Bandettini, P.A., Hillman, E.M., "Comparisons of dynamic functional connectivity of neuronal and hemodynamic activity in awake mice" Society for Neuroscience Annual Meeting 2018

Handwerker, D.A., Gonzalez-Castillo, J., Nielson, D., Zheng, C., Molfese, P., Bandettini, P.A., "Moving away from ICA in multi-echo fMRI denoising" Organization for Human Brain Mapping Annual Meeting 2018

Jangraw, D., Finn, E., Gonzalez-Castillo, J., **Handwerker, D.A.**, Ghane, M., Rosenberg, M., Panwar, P., Bandettini, P.A., "Functional connectivity-based predictor of reading recall generalizes to multi-task data" Organization for Human Brain Mapping Annual Meeting 2018

Topolski, N., Finn, E., **Handwerker, D.A.**, Bandettini, P.A., "Examining behavioral prediction using task-induced functional connectivity networks" Organization for Human Brain Mapping Annual Meeting 2018

Hall, A., Huber, L., **Handwerker, D.A.**, Finn, E., Bandettini, P.A., "Detection of differences between sleep deprived and well rested brains using T1w structural MRI" Organization for Human Brain Mapping Annual Meeting 2018

Jangraw, D.C., Gonzalez-Castillo, J., **Handwerker, D.A.**, Ghane, M., Rosenberg, M.D., Panwar, P., Bandettini, P.A., "Functional connectivity-based neuromarker outperforms gaze, pupillary, and fMRI activation-based markers in predicting reading comprehension" Society for Neuroscience Annual Meeting 2017

Chai, Y., **Handwerker, D.A.**, Gonzalez-Castillo, J., Bandettini, P.A., "Steady-state visual stimulation frequency modulates functional networks" Society for Neuroscience Annual Meeting 2017

Szczepanik, J.E., Martin-Soelch, C., Reed, J.L, Nugent, A.C., **Handwerker, D.A.**, Thomas, A.G., Zarate, C.A., Drevets, W.C. "Monetary incentive alters neural response during a spatial working memory task and differentiates unmedicated bipolar and unipolar depressed subjects" Society for Neuroscience Annual Meeting 2017

Handwerker, D.A., Ianni, G., Gutierrez, B., Roopchansingh, V., Gonzalez-Castillo, J., Ungerleider, L, Bandettini, P., Pitcher, D., "Network changes in response to thetaburst TMS to the rpSTS" Organization for Human Brain Mapping Annual Meeting 2017

Hall, A., Huber, L, **Handwerker, D.A.**, Gonzalez-Castillo, J., Topolski, N., Bandettini, P., "Evaluation of Physiological Noise Cleaning Methods at High-Resolution across Cortical Depth" Organization for Human Brain Mapping Annual Meeting 2017

Topolskia, N., Jangraw, D., Gonzalez-Castillo, J., **Handwerker, D.**, Panwar, P., Bandettini, P., "FMRI Connectivity is Differentially Associated with Performance Across Tasks in a Multi-Task Study" Organization for Human Brain Mapping Annual Meeting 2017

SELECTED TEACHING AND TALKS

National Institutes of Health

The least bad ways to remove noise	6/27/19
Why is noise removal so hard to solve?	6/25/19
Advantages of multi-echo fMRI	5/5/19
Functional connectivity using wide-field optical mapping in mice	1/15/19
Minimizing Noise During fMRI Acquisition	6/16/17,6/25/18
Software Carpentry "Automating tasks with the Unix shell"	9/28/17
How do we know what signal is neural and what is not?	7/18/14,7/13/15 6/17/16,6/19/17
fMRI Data Sharing	8/5/15
fMRI and Big Data	8/4/14
Panel on "What's a good fMRI study? What's a bad fMRI study?"	8/15/12
Panel on "How can fMRI make inroads in clinical applications"	8/13/12
Basics of Resting State fMRI	7/12, 7/13
Panel on "What is a good or bad fMRI study and clinical uses"	8/26/11
Connectivity of fMRI fluctuations	7/12,15/11 8/17,19/10
Altering chest pressure to measure cerebrovascular reactivity	1/28/11
Global signal changes with chest pressure	8/9/10
Diffusion-based tractography: Methodology and Applications	7/15/10
Properties of resting state fMRI	8/5/09
Introduction to Diffusion Tensor Imaging	2/11/09
Quantifying and managing fMRI BOLD response variability	4/20/07

Organization for Human Brain Mapping Annual Meeting 7/3/20

Symposium Co-chair: Two is Better than One (and Many are Better):
Multi-echo fMRI methods and applications
Symposium Speaker: How to Decide if Multi-echo fMRI can Improve your Study?

Organization for Human Brain Mapping Annual Meeting Educational Course

How to minimize noise at the acquisition stage 6/25/17

American Society of Neuroradiologists Annual Meeting

Test-retest reliability for a massively repeated block design task 5/24/16

Applied Physical Society Annual Meeting

Noninvasive, dynamic human brain imaging with fMRI 3/2/14

Foundation for Advanced Education in the Sciences

Introduction to fMRI" (lectures in an MRI course) 11/21,28/11 11/29/10

Johns Hopkins University

Biomed Engineering 580.202 *"BME in the real world: Getting and using a Ph.D."* 4/1/08

GRANT

Co-Investigator on NIMH BRAIN Initiative Grant R01-MH114276 (Lead PI: Elizabeth Hillman)

JOURNALS REFEREED

Cerebral Cortex
Human Brain Mapping
IEEE Transactions in Medical Imaging
Neural Networks
NeuroImage
NeuroImage Clinical

PROFESSIONAL SERVICE

National Institutes of Health

NIMH Intramural Research Program Outstanding Mentor Award 2019

NIMH Antiracism Task Force Member 2020
"Listening to each other" and "Recommendations Writing" subgroups

Supporting many members in the Section on Functional Imaging Methods 10/08 – Present
Includes day-to-day management and mentorship responsibilities for postdoctoral, predoctoral, post baccalaureate, and undergraduate trainees

Regular Judge or Lead Judge for Intramural Summer student, postbaccalaureate, and graduate student poster presentations 2015 – Present

NIMH Staff Scientist Committee Member 2016 – Present

University of California, Berkeley
Graduate Assembly Mental Health Task Force 9/03 – 5/05
University Health Services Advisory Committee on Graduate Mental Health 10/03 – 5/05
Helped organize, conduct and publicize one of the first surveys of graduate student mental health in the nation and draft the preliminary documents for the UC Berkeley Chancellor's Mental Health Task Force.

UC Berkeley / UC San Francisco Joint Graduate Group in Bioengineering
Qualifying Exam Advisor 9/03-9/04
Advised students on how to prepare for their research qualifying exams.
Attended many practice exams and gave comments.
Updated much of the department advice literature on qualifying exams.

Peer Mentor 9/01 – 9/02
Coordinated all student-based guidance of incoming graduate students.
Began & facilitated a web-group so current students could help incoming students.
Completed a major revision of the orientation materials for incoming students.